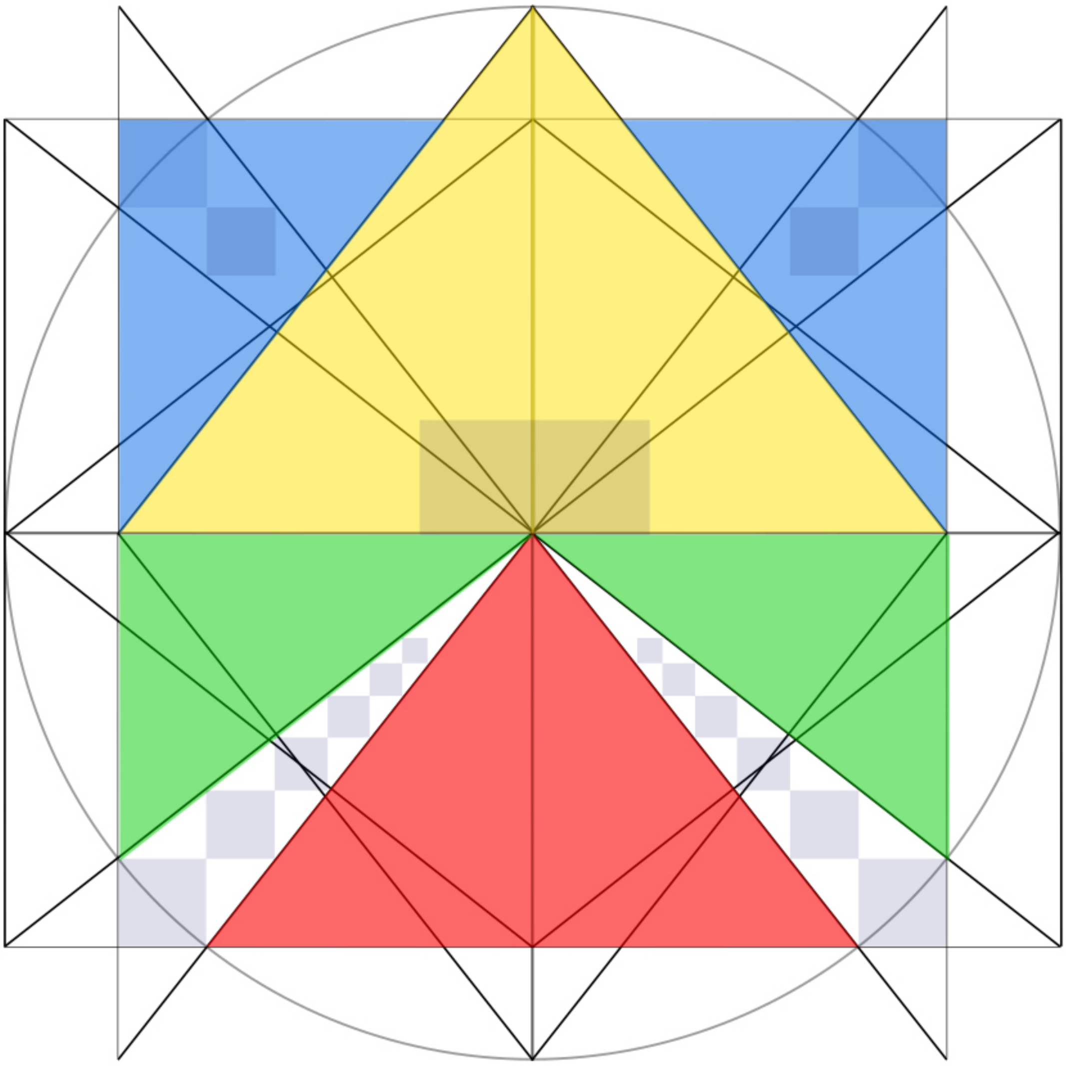
Pi versus Pi

(a comparison)



3.141 v 3.144

Carl Thompson

For the past year I have been comparing different values of Pi, and in this book we will compare two values for Pi and you will see that one value has perfect symmetry, and one does not.

Both the circle and the square are geometrical, perfectly symmetrical, therefore we would expect Pi to have perfect symmetry.

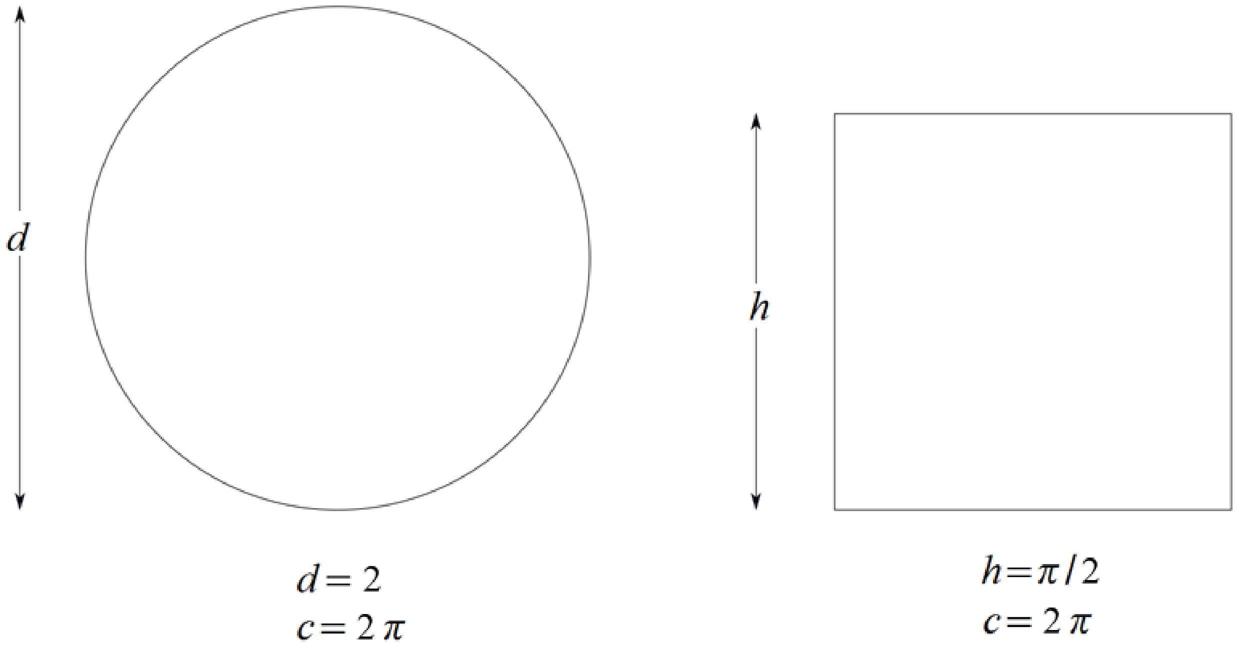
The mathematics used in this book aim to be simple and easily understood.

This book 'Pi verses Pi' is the companion book to 'Proof of Pi (a comparison)'.

By Carl D. Thompson

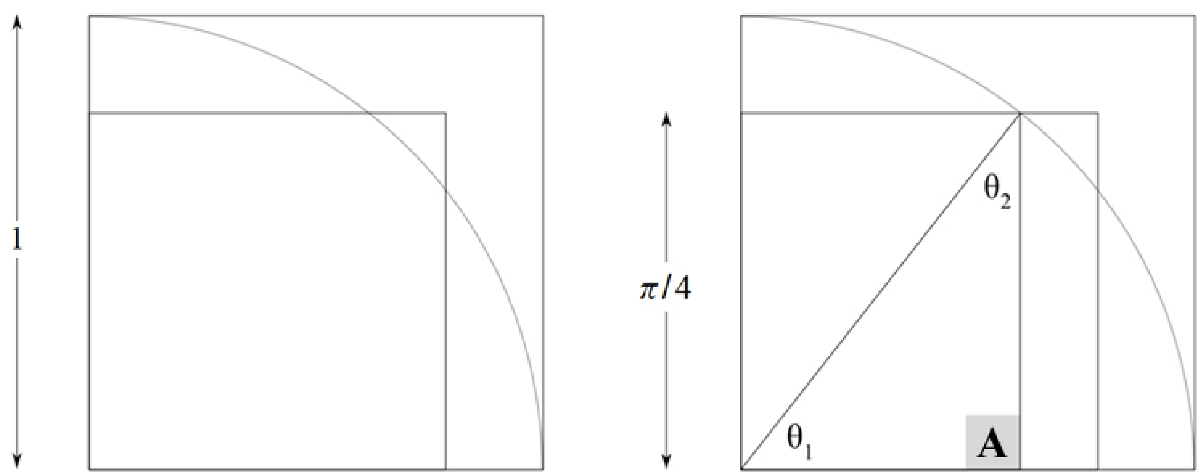
We start with a circle and a square with the same

circumference/perimeter (c). (Fig. 1)



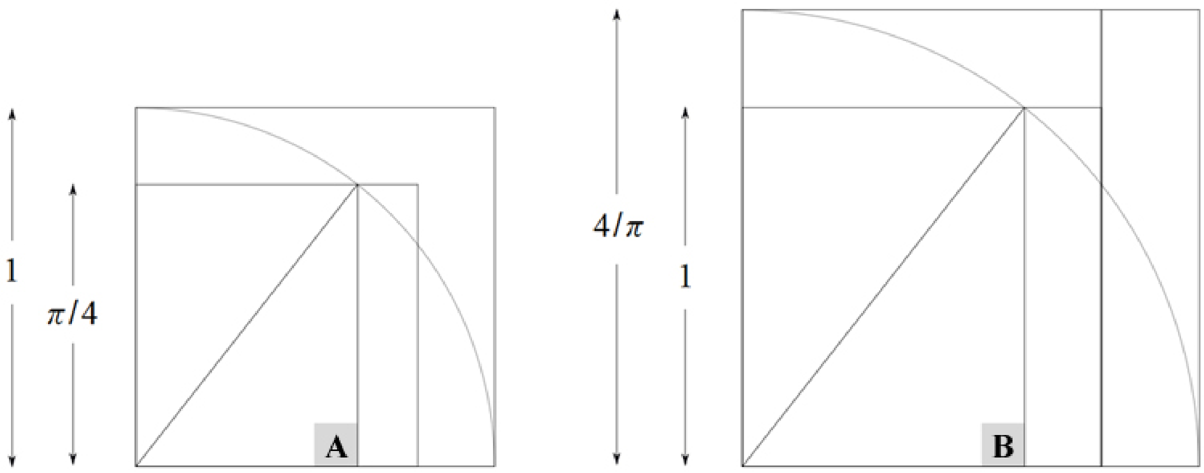
(Figure. 1)

We place the circle on top of the square and zoom into the top right quarter; put a unit square around it and create our first triangle A. (Fig. 2)



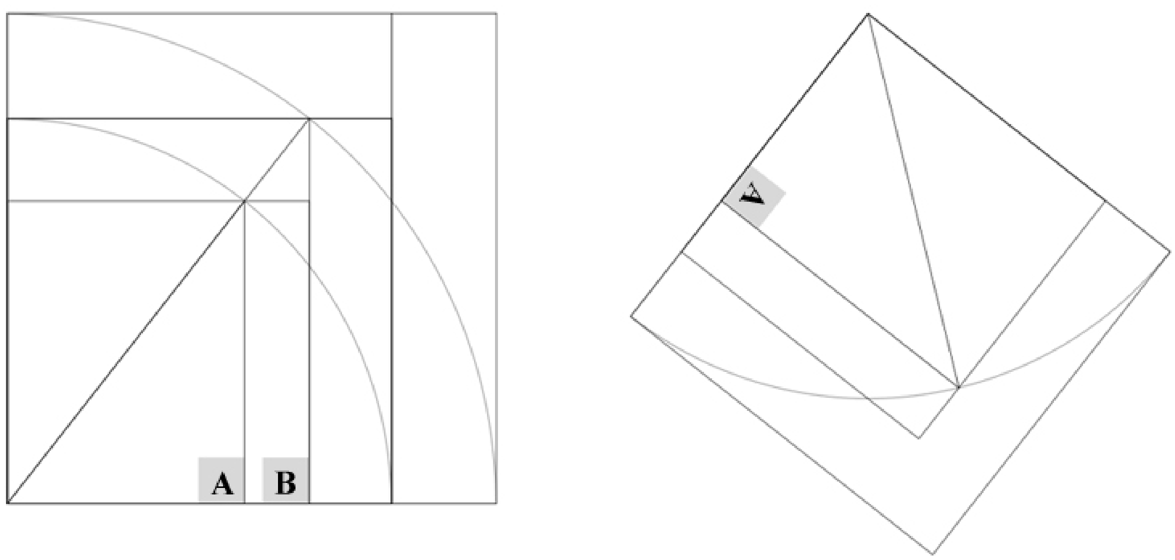
(Figure. 2)

We create a copy of our quarter squared circle and multiply it by a factor of 4/Pi, this gives us triangle B. (Fig. 3)



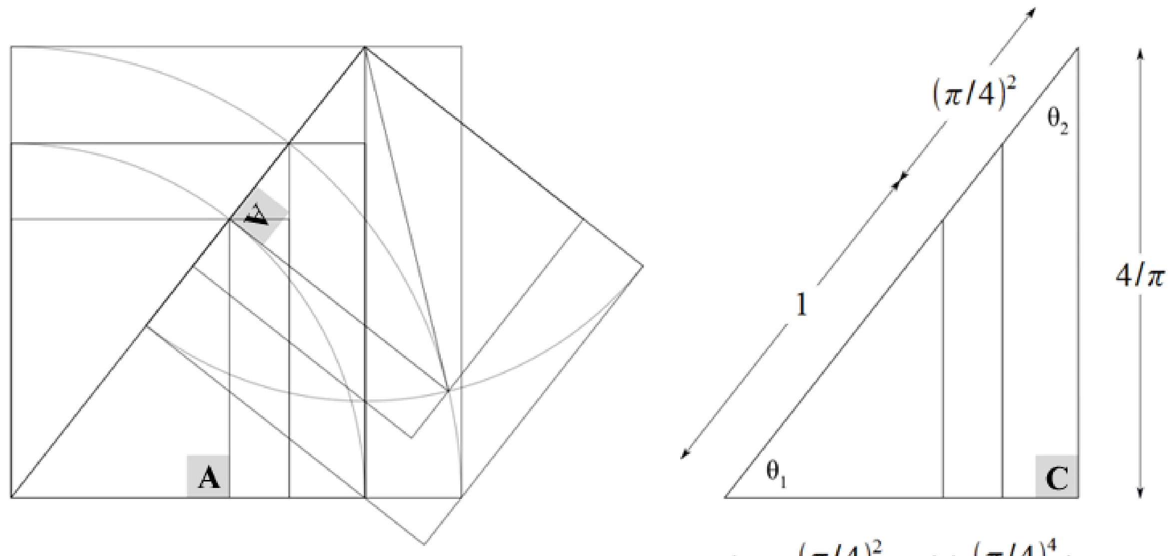
(Figure. 3)

We combine our two squared circles and add another squared circle rotated at an angle. (Fig. 4)



(Figure. 4)

Next we combine our squared circles and create our next triangle C. (Fig. 5)

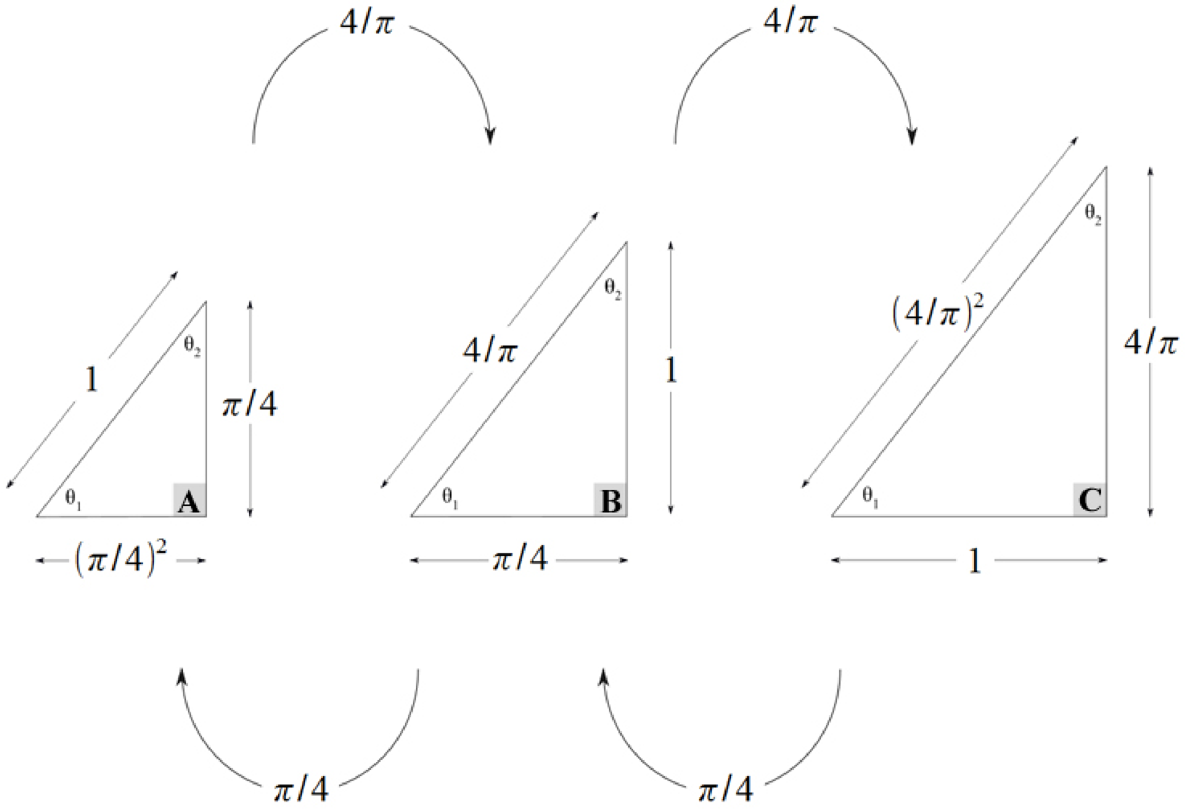


(Figure. 5)

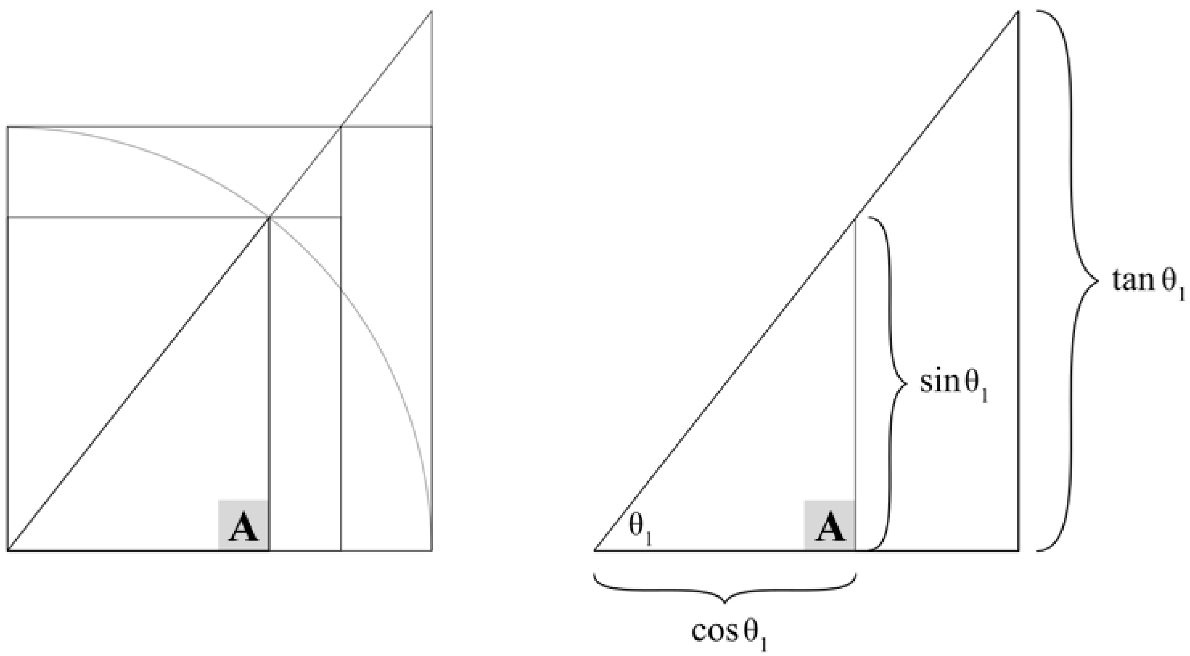
The values for $(\text{Pi}/4)^2$ in triangle C (Fig. 5) are from the normalised triangles. (Fig. 6)

Because a triangle has three sides it can be normalised in three ways, with exceptions. A normalised triangle is simply a triangle with the one or more side-lengths equal to one.

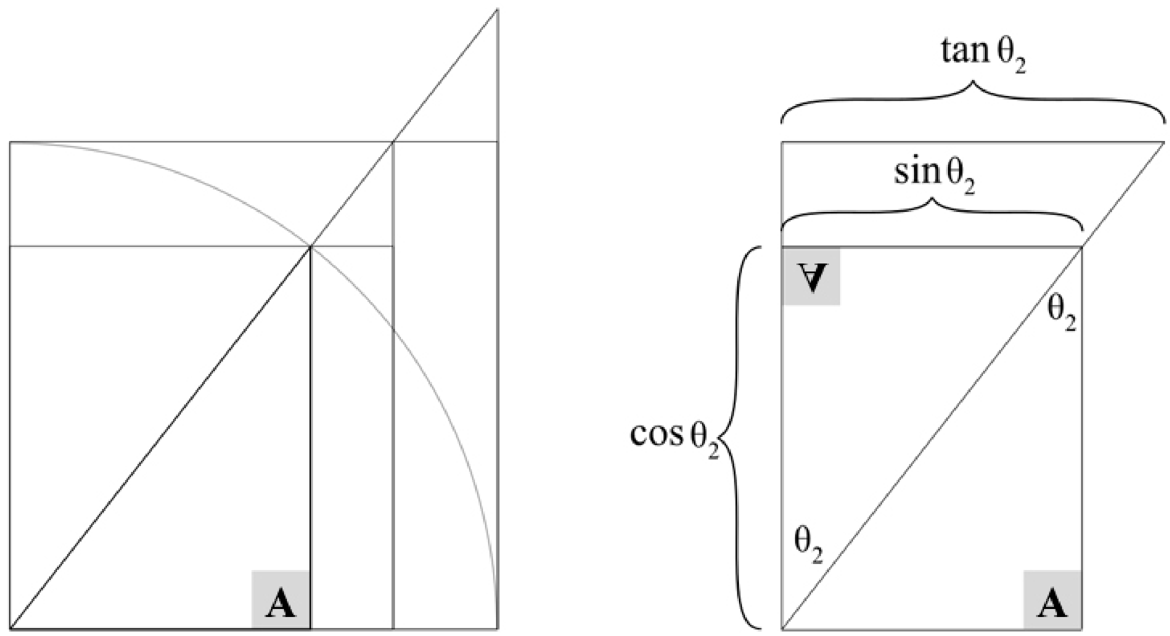
We can normalise triangle A and amazingly we can extrapolate every value using a simple conversion factor of 4/Pi and its reciprocal. (Fig. 6)



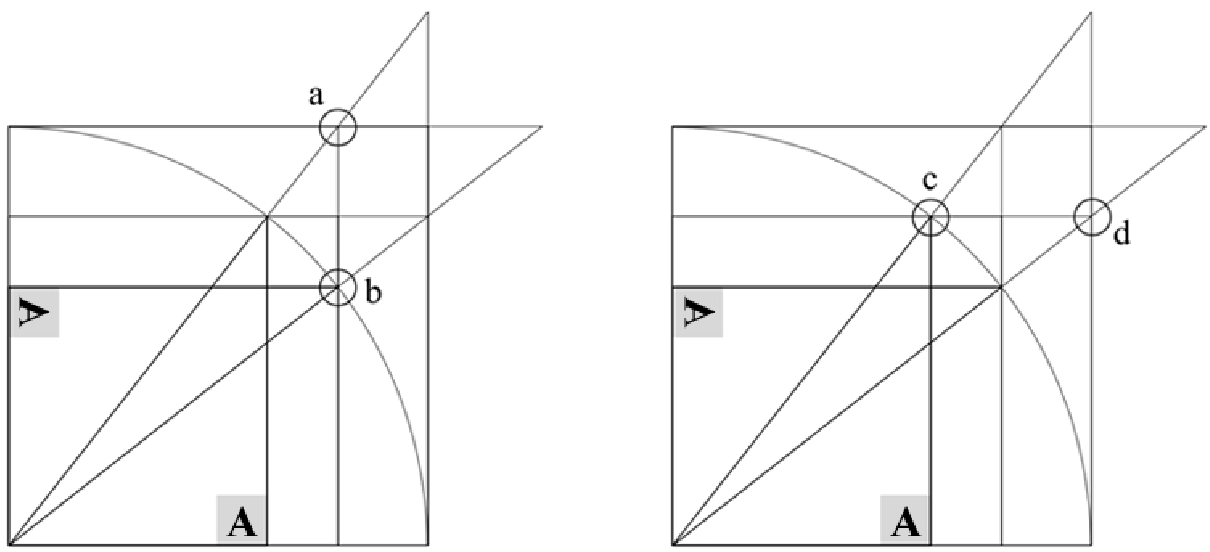
(Figure. 6)



(Figure. 7)

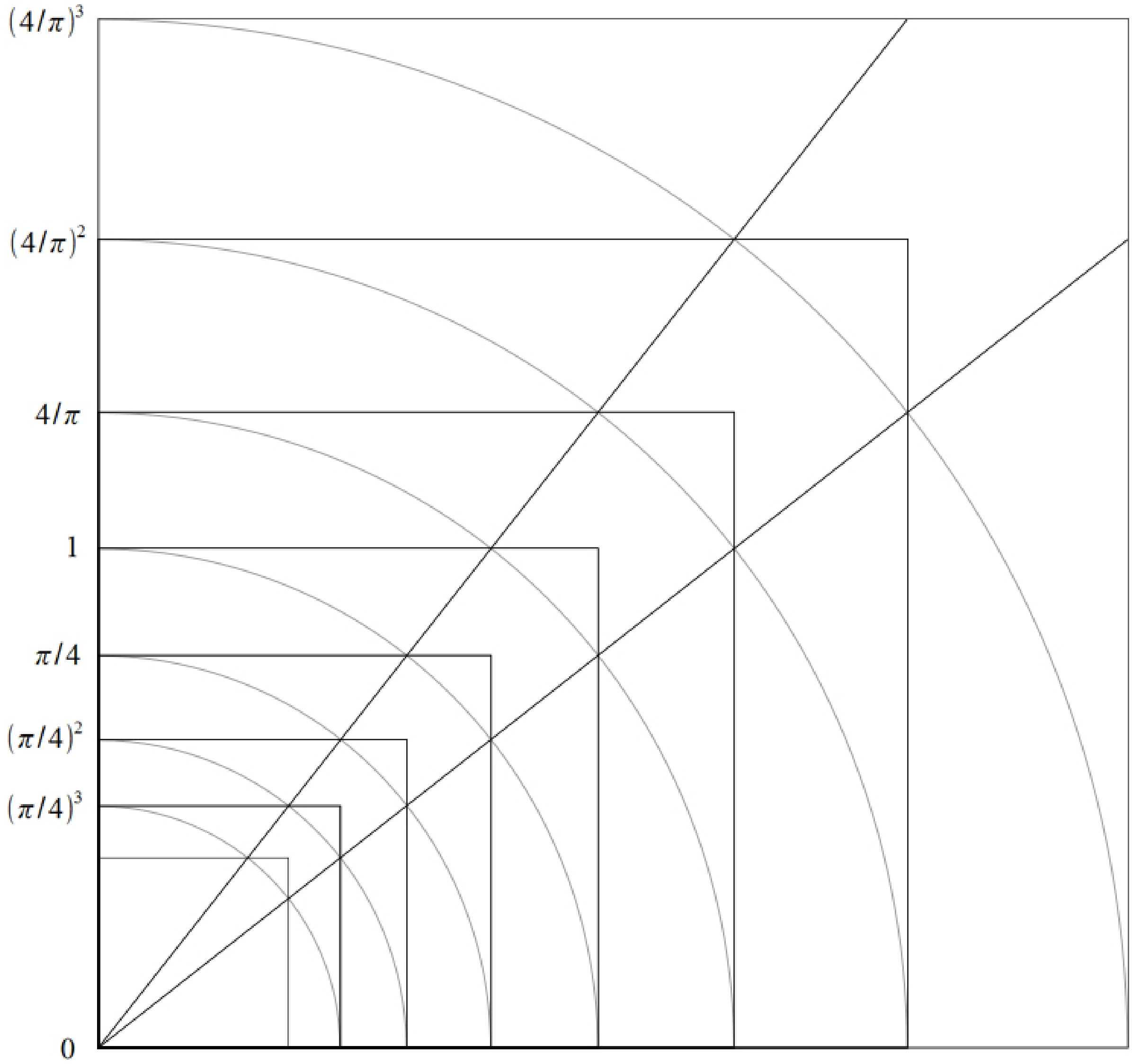


(Figure. 8)



(Figure. 9)

Each of the following squares and circles are a factor of 4/Pi larger or Pi/4 smaller. (Fig. 10)



(Figure. 10)

In this next section we will compare two different values for Pi.

Π	3.14159265358979323846264..	3.14460551102969314427823..
$\Pi/4$	0.78539816339744830961566..	0.78615137775742328606955..
$4/\Pi$	1.27323954473516268615107..	1.27201964951406896425242..
$(\Pi/4)^2$	0.61685027506808491367715..	0.61803398874989484820458..
$(4/\Pi)^2$	1.62113893827740434310207..	1.61803398874989484820458..
$(\Pi/4)^4$	0.38050426185157202045484..	0.38196601125010515179541..
$(4/\Pi)^4$	2.62809145719918980842311..	2.61803398874989484820458..
Θ_1	51.75751851602196819380\37..	51.82729237298775250653\16..
Θ_2	38.24248148397803180619\62..	38.17270762701224749346\83..
$\sin\Theta_1$	0.78539816339744830961566..	0.78615137775742328606955..
$\cos\Theta_1$	0.61899089244666200203422..	0.61803398874989484820458..
$\tan\Theta_1$	1.26883638027860886803898..	1.27201964951406896425242..
$\sin\Theta_2$	0.61899089244666200203422..	0.61803398874989484820458..
$\cos\Theta_2$	0.78539816339744830961566..	0.78615137775742328606955..
$\tan\Theta_2$	0.78812368209399997898631..	0.78615137775742328606955..
arcsin $\Pi/4$	51.7575185160219681938037..	51.8272923729877525065316..
arccos $\Pi/4$	38.2424814839780318061962..	38.1727076270122474934683..
arctan $\Pi/4$	38.1460259872225475454755..	38.1727076270122474934683..

Is $(4/Pi)^2$ equal to 1 plus Cos Theta1? (Fig. 5)

$(4/\Pi)^2$	1.62113893827740434310207..	1.61803398874989484820458 6..
$\cos \Theta_1$	0.61899089244666200203422..	0.61803398874989484820458 6..
	NO	YES

Is $(4/Pi)^2$ equal to $(Pi/4)^2$ plus 1? (Fig. 5)

$(4/\Pi)^2$	1.62113893827740434310207..	1.61803398874989484820458 6..
$(\Pi/4)^2$	0.61685027506808491367715..	0.61803398874989484820458 6..
	NO	YES

Is $(Pi/4)^2$ plus $(Pi/4)^4$ equal 1? (Fig. 5)

$(\Pi/4)^2$	0.61685027506808491367715..	0.61803398874989484820458 6..
$(\Pi/4)^4$	0.38050426185157202045484..	0.38196601125010515179541 2..
	NO	YES

Is Pi/4 equal to Sin Theta1? (Fig. 7)

$\Pi/4$	0.78539816339744830961566..	0.78615137775742328606955 8..
$\sin \Theta_1$	0.78539816339744830961566..	0.78615137775742328606955 8..
	YES	YES

Is $(Pi/4)^2$ equal to Cos Theta1? (Fig. 7)

$(\Pi/4)^2$	0.61685027506808491367715..	0.618033988749894848204586..
$\cos\Theta_1$	0.61899089244666200203422..	0.618033988749894848204586..
	NO	YES

Is 4/Pi equal to Tan Theta1? (Fig. 7)

$4/\Pi$	1.27323954473516268615107..	1.272019649514068964252422..
$\tan\Theta_1$	1.26883638027860886803898..	1.272019649514068964252422..
	NO	YES

Is $(Pi/4)^2$ equal to Sin Theta2? (Fig. 8)

$(\Pi/4)^2$	0.61685027506808491367715..	0.618033988749894848204586..
$\sin\Theta_2$	0.61899089244666200203422..	0.618033988749894848204586..
	NO	YES

Is Pi/4 equal to Cos Theta2? (Fig. 8)

$\Pi/4$	0.78539816339744830961566..	0.786151377757423286069558..
$\cos\Theta_2$	0.78539816339744830961566..	0.786151377757423286069558..
	YES	YES

Is Pi/4 equal to Tan Theta2? (Fig. 8)

$\Pi/4$	0.78539816339744830961566..	0.786151377757423286069558..
$\tan \Theta_2$	0.78812368209399997898631..	0.786151377757423286069558..
	NO	YES

Is Cos Theta1 is equal to Tan Theta1?

$\cos \Theta_1$	0.78539816339744830961566..	0.786151377757423286069558..
$\tan \Theta_1$	0.78812368209399997898631..	0.786151377757423286069558..
	NO	YES

Is Theta1 equal to Arcsin Pi/4?

Θ_1	51.7575185160219681938037..	51.82729237298775250653169..
arcsin $\Pi/4$	51.7575185160219681938037..	51.82729237298775250653169..
	YES	YES

Is Theta2 equal to Arccos Pi/4?

Θ_2	38.2424814839780318061962..	38.17270762701224749346830..
arccos $\Pi/4$	38.2424814839780318061962..	38.17270762701224749346830..
	YES	YES

Is Theta2 equal to Arctan Pi/4?

Θ_2	38.2424814839780318061962..	38.17270762701224749346830..
arctan Π/4	38.1460259872225475454755..	38.17270762701224749346830..
	NO	YES

Is Arccos Pi/4 is equal to Arctan Pi/4?

arccos Π/4	38.2424814839780318061962..	38.17270762701224749346830..
arctan Π/4	38.1460259872225475454755..	38.17270762701224749346830..
	NO	YES

Is point a directly above point b? (Fig. 9)

	NO	YES

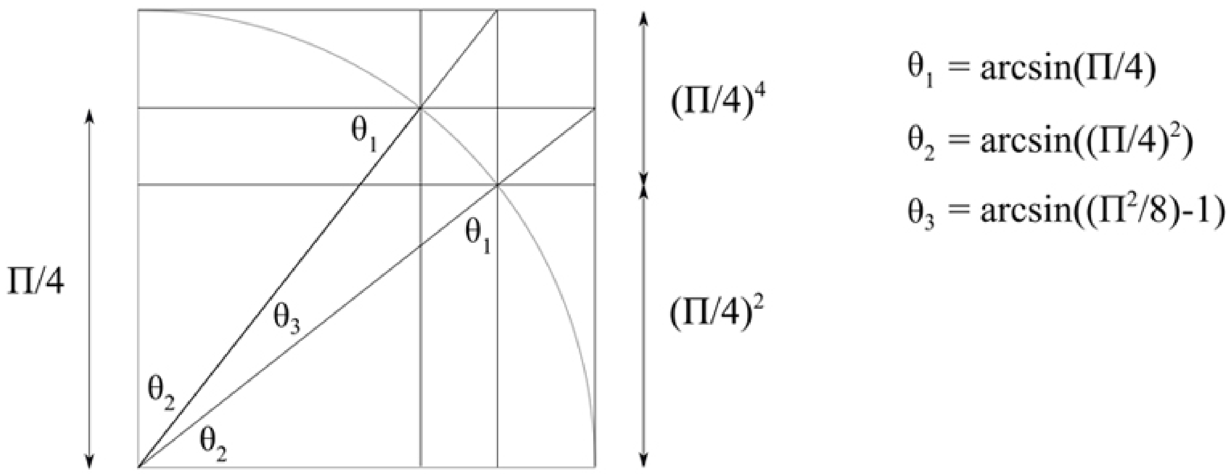
Is point c directly adjacent to point d? (Fig. 9)

	NO	YES

In this section we will concentrate on this new version of Pi. It can be expressed as a fraction.

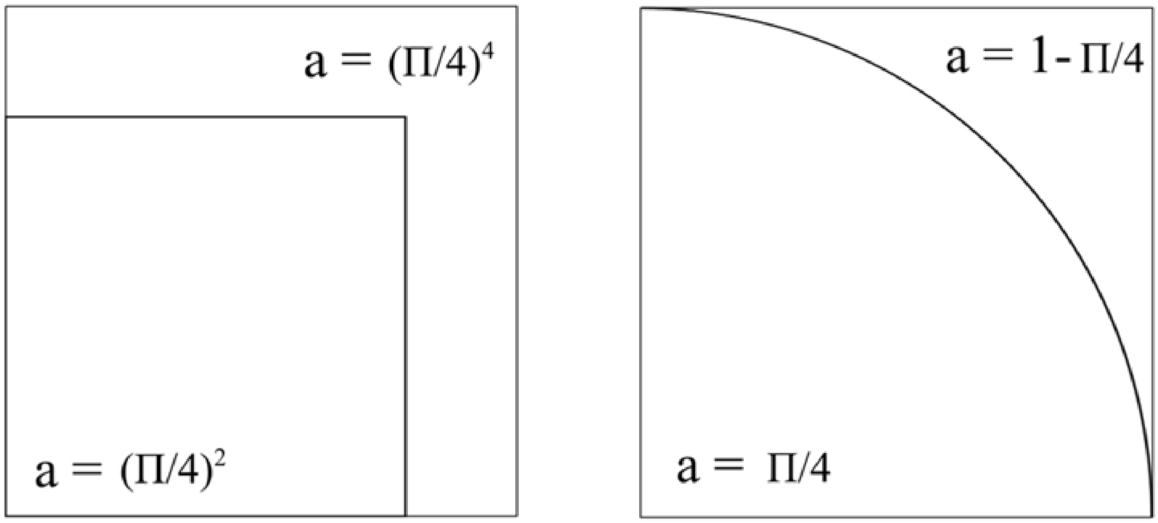
$$\pi = 4\sqrt{\sqrt{5/4} - \sqrt{1/4}}$$

We can express all angles and lengths in the squared circle using Pi. (Fig. 11)



(Figure. 11)

The areas can also be expressed using Pi. (Fig. 12)



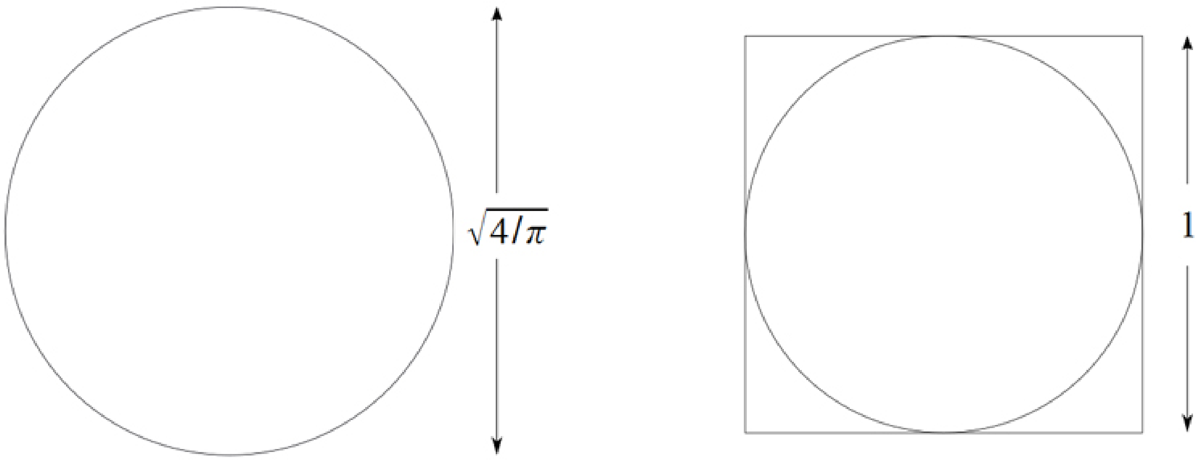
(Figure. 12)

Adding and subtracting the areas gives us the following.

$$(\pi/4)^2+(\pi/4)^4=1$$
$$\pi/4+(1-\pi/4)=1$$

$$(\pi/4)^2-(\pi/4)^4=(\pi^2/8)-1$$
$$\pi/4-(1-\pi/4)=(\pi-2)/2$$

These next sets of circles and squares all have there areas (a) and circumferences (c) marked, along with the diameter of the circles and the height of the squares. (Fig. 13-15)

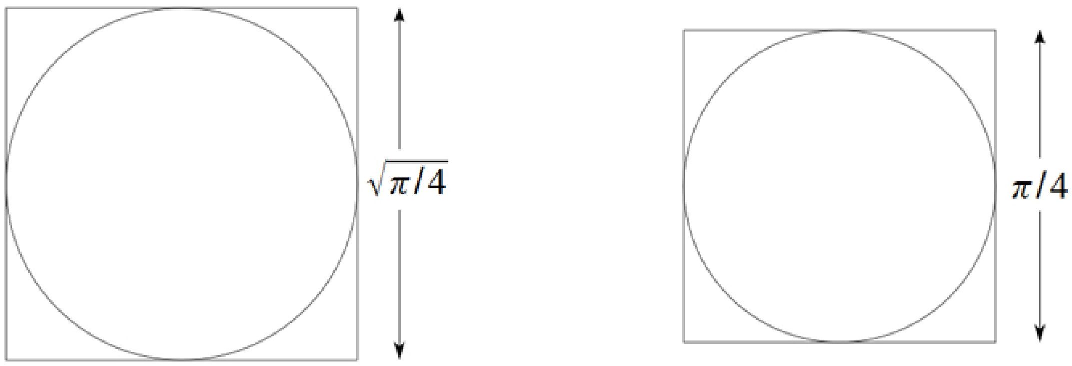


Circle [#1]
$a=1$
$c=4\sqrt{\pi/4}$

Circle [#2]
$a=\pi/4$
$c=\pi$

Square [#1]
$a=1$
$c=4$

(Figure. 13)



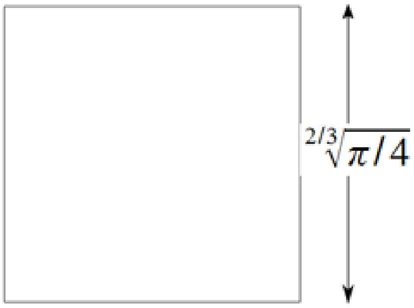
Circle [#3]
$a=(\pi/4)^2$
$c=4\sqrt[2/3]{\pi/4}$

Square [#2]
$a=\pi/4$
$c=4\sqrt{\pi/4}$

Circle [#4]
$a=(\pi/4)^3$
$c=\pi^2/4$

Square [#3]
$a=(\pi/4)^2$
$c=\pi$

(Figure. 14)



Square #4

$a=(\pi/4)^3$

$c=4\sqrt[2/3]{\pi/4}$

(Figure. 15)

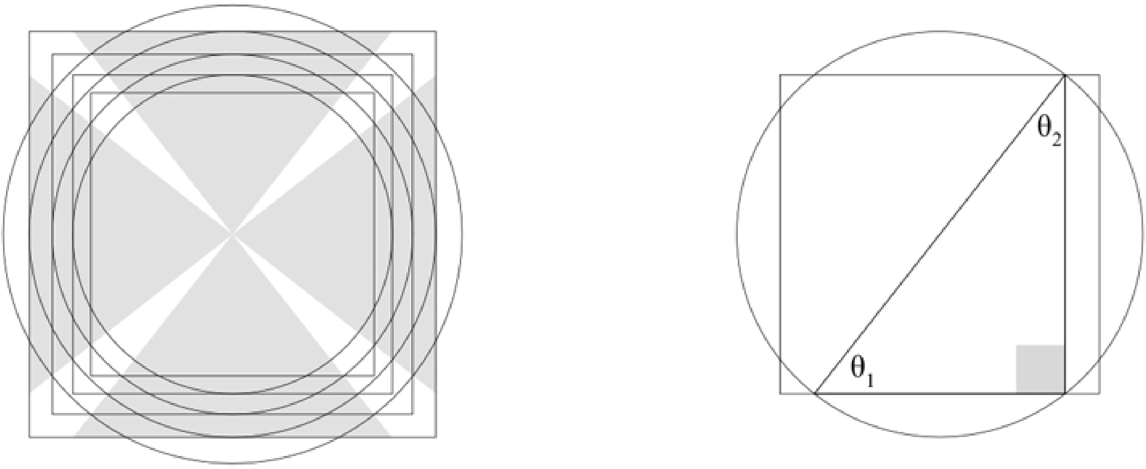
The side-length of square #1 is equal to the diameter of circle #2. The same is true for square #2 and circle #3 and square #3 and circle #4.

Also, circle #1 and square #1 have the same area. As do circle #2 and square #2, circle #3 and square #3 and circle #4 and square #4.

Also, circle #1 and square #2 have the same circumference. As do circle #2 and square #3 and circle #3 and square #4.

Next we stack all the circles and squares on top of each other.

The point marked by the triangles below is the point where the circumference of the circle and the circumference of the square are equal. (Fig. 16)

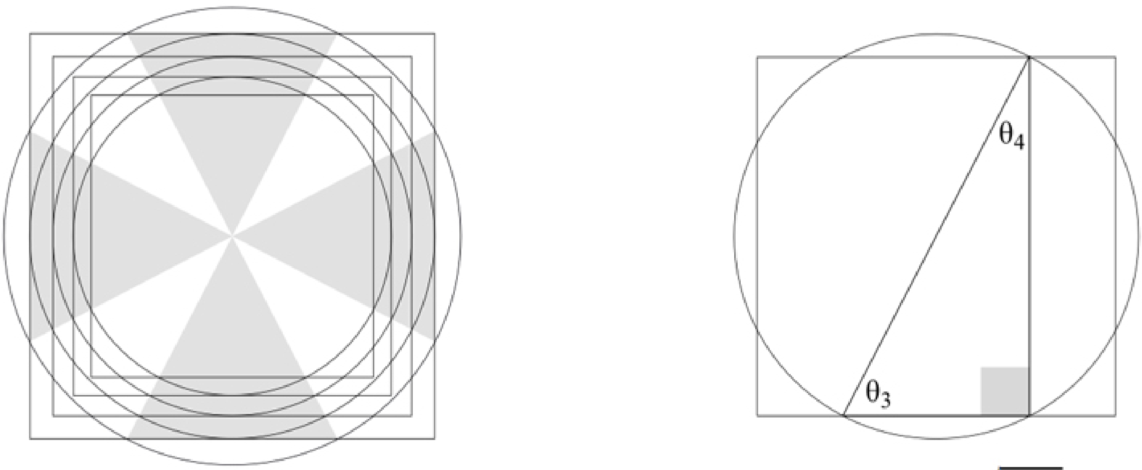


$\theta_1 = \arcsin(\pi/4)$

$\theta_2 = \arcsin((\pi/4)^2)$

(Figure. 16)

The point marked by the triangles below is the point where the area of the circle and the area of the square are equal. (Fig. 17)



$\theta_3 = \arcsin(\sqrt{\pi/4})$

$\theta_4 = \arcsin(\sqrt{1-(\pi/4)})$

(Figure. 17)

The perfect symmetry of Pi is shown in the simplicity of the following equations.

$$\pi = 4\sqrt{\sqrt{5/4} - \sqrt{1/4}} \qquad 1/\pi = 1/4\sqrt{\sqrt{5/4} + \sqrt{1/4}}$$

$$\pi/4 = \sqrt{\sqrt{5/4} - \sqrt{1/4}} \qquad 4/\pi = \sqrt{\sqrt{5/4} + \sqrt{1/4}}$$

$$(\pi/4)^2 = \sqrt{5/4} - \sqrt{1/4} \qquad (4/\pi)^2 = \sqrt{5/4} + \sqrt{1/4}$$

$$(\pi/4)^4 = 6/4 - \sqrt{5/4} \qquad (4/\pi)^4 = 6/4 + \sqrt{5/4}$$

$$(\pi/4)^8 = 14/4 - 3\sqrt{5/4} \qquad (4/\pi)^8 = 14/4 + 3\sqrt{5/4}$$

Pi=3.14460551102969314427823434337183571
8092488231350892950659607880404728190489
2436548476515566340325422595160489765784
4522350184148188477210145800112384535316
5996996312394461433089560244722401385137
3131501976513250168886718624703787313359
4349618276234248844199296961553849723700
5573835522346890745364169801420436964094
3817463269453772663395414398903709747924
2491578892978023339064417670841722688275
1538059217399702642302385119424224408199
2685573437499657987944611238911016107551
3872073582816575721818..

"Every explicit duality is an implicit unity." Alan W. Watts